Claims

[c1] 1. A flexible imager for imaging a subject illuminated by incident radiation, said flexible imager comprising:

a flexible substrate;

a photosensor array disposed on said flexible substrate; and

a scintillator disposed so as to receive and absorb the incident radiation, configured to convert the incident radiation to optical photons, and optically coupled to said photosensor array,

wherein said photosensor array is configured to receive the optical photons and to generate an electrical signal corresponding to the optical photons.

[c2] 2.The flexible imager of Claim 1, wherein said flexible substrate comprises a polymer.

[c3] 3.The flexible imager of Claim 2, wherein said flexible substrate comprises a flexible organic polymer.

[c4] 4.The flexible imager of Claim 3, wherein said flexible substrate comprises polyimide.

[c5] 5.The flexible imager of Claim 2, wherein said flexible substrate is about two (2) mils to about ten (10) mils in thickness.

[c6] 6.The flexible imager of Claim 5, wherein said flexible substrate is about three (3) mils to about eight (8) mils in thickness.

[c7] 7.The flexible imager of Claim 1, further comprising a back surface layer disposed on a back surface of said flexible substrate.

[c8] 8.The flexible imager of Claim 7, wherein said back surface layer comprises a plurality of heating elements.

[c9]

9.The flexible imager of Claim 1, wherein said photosensor array comprises a plurality of photosensors and an addressable thin film transistor (TFT) array comprising a plurality of TFTs,

wherein each of said TFTs is electrically coupled to a respective one of said

photosensors so as to selectively address respective photosensors in said photosensor array,
wherein each of said TFTs comprises a gate electrode, a semiconductive region disposed over said gate electrode, and a source electrode and a drain electrode in contact with and disposed over said semiconductive region, and
wherein each of said semiconductive regions comprises a layer of intrinsic amorphous Silicon (a-Si) and a layer of doped amorphous Silicon disposed over said layer of intrinsic a-Si.

[c10] 10.The flexible imager of Claim 9, wherein said addressable TFT array is situated between said flexible substrate and said plurality of photosensors, wherein each of said photosensors comprises an amorphous-Silicon photodiode, and wherein said flexible imager further comprises:
a coating layer, disposed between said flexible substrate and said addressable TFT array; and
a cover layer disposed over said scintillator.

[c11] 11.The flexible imager of Claim 1, wherein said photosensor array comprises a plurality of photosensors and an addressable thin film transistor (TFT) array comprising a plurality of TFTs,
wherein each of said TFTs is electrically coupled to a respective one of said photosensors so as to selectively address respective photosensors in said photosensor array, and
wherein each of said TFTs comprises a gate electrode, a semiconductive region comprising an organic semiconductor and disposed over said gate electrode, and a source electrode and a drain electrode in contact with said semiconductive region.

[c12] 12.The flexible imager of Claim 11, wherein said semiconductive region is disposed over said source and drain electrodes, wherein said plurality of photosensors is situated between said flexible substrate and said addressable TFT array, wherein said TFTs are optically transparent, and wherein said flexible imager further comprises a cover layer disposed over said scintillator.

[c13] 13.The flexible imager of Claim 1, wherein said scintillator comprises cesium

iodide.

[c14] 14.The flexible imager of Claim 1, wherein said scintillator comprises a phosphor screen.

[c15] 15.A flexible digital imager for imaging a subject illuminated by incident radiation, said flexible digital imager comprising:
a flexible substrate;
a photosensor array disposed on said flexible substrate, said photosensor array comprising a plurality of photosensors and an addressable thin film transistor (TFT) array comprising a plurality of TFTs, said photosensors being arranged to form a plurality of columns and at least one row, and each of said TFTs being electrically coupled to a respective one of said photosensors so as to selectively address respective photosensors in said photosensor array; and
a scintillator disposed so as to receive and absorb the incident radiation, configured to convert the incident radiation to optical photons, and optically coupled to said photosensor array,
wherein said photosensor array is configured to receive the optical photons and to generate an electrical signal corresponding to the optical photons.

[c16] 16.The flexible digital imager of Claim 15, wherein said flexible substrate comprises a flexible organic polymer and is about three (3) mils to about eight (8) mils in thickness.

[c17] 17.The flexible digital imager of Claim 15, further comprising a back surface layer disposed on a back surface of said flexible substrate, said back surface layer comprising a plurality of heating elements.

[c18] 18.The flexible digital imager of Claim 15, wherein said photosensors are arranged to form one row.

[c19] 19.The flexible digital imager of Claim 15, wherein said photosensors are arranged to form a plurality of rows.

[c20] 20.The flexible digital imager of Claim 15, wherein each of said TFTs comprises a gate electrode, a semiconductive region disposed over said gate electrode,

and a source electrode and a drain electrode in contact with and disposed over said semiconductive region, and

wherein each of said semiconductive regions comprises a layer of intrinsic amorphous Silicon (a-Si) and a layer of doped amorphous Silicon disposed over said layer of intrinsic a-Si.

[c21] 21.The flexible digital imager of Claim 20, wherein said addressable TFT array situated between said flexible substrate and said photosensors, each of which comprises an amorphous-Silicon photodiode, and wherein said flexible digital imager further comprises a coating layer, disposed between said flexible substrate and said addressable TFT array.

[c22] 22.The flexible digital imager of Claim 15, wherein each of said TFTs comprises a gate electrode, a semiconductive region comprising an organic semiconductor and disposed over said gate electrode, and a source electrode and a drain electrode in contact with said semiconductive region.

[c23] 23.The flexible digital imager of Claim 22, wherein said semiconductive region is disposed over said source and drain electrodes, wherein said plurality of photosensors is situated between said flexible substrate and said addressable TFT array, and wherein said TFTs are optically transparent.

[c24] 24.A digital imaging method for imaging a subject, said digital imaging method comprising:

conforming a flexible digital imager to the subject, the subject being positioned between the flexible digital imager and a radiation source;

activating the radiation source to expose the subject to radiation; and

collecting an image with the flexible digital imager.

[c25] 25.The digital imaging method of Claim 24, wherein the flexible digital imager comprises a plurality of photosensors arranged in a linear array.

[c26] 26. The digital imaging method of Claim 24, wherein the flexible digital imager comprises a plurality of photosensors arranged in a two dimensional (2D) array.

[c27] 27.The digital imaging method of Claim 24, wherein the radiation source

comprises an x-ray source configured to expose the flexible digital imager to x-ray radiation.

[c28] 28.The digital imaging method of Claim 24, wherein the subject is a portion of an aircraft.

[c29] 29.The digital imaging method of Claim 28, wherein the subject is a fuselage, and wherein said conforming step comprises wrapping the flexible imager around at least a portion of the fuselage.

[c30] 30.The digital imaging method of Claim 28, wherein the subject is an aircraft wing, and wherein said conforming step comprises wrapping the flexible imager around at least a portion of the aircraft wing.

[c31] 31.A digital imaging method for imaging a subject using a radiation source configured to emit a diverging radiation beam, said digital imaging method comprising:
bending a flexible digital imager comprising a scintillator having a columnar structure to align the columnar structure parallel with the diverging radiation beam;
positioning the flexible digital imager such that the subject is between the radiation source and the flexible imager;
activating the radiation source to expose the subject to the diverging radiation beam; and
collecting an image with the flexible digital imager.

[c32] 32.The digital imaging method of Claim 31 further comprising adjusting a distance between the radiation source and the flexible digital imager to align the columnar structure of the scintillator with the diverging radiation beam.

[c33] 33.A digital imaging method for imaging a subject, said digital imaging method comprising:
embedding at least one flexible digital imager in the subject;
activating a radiation source to expose the subject to a diverging radiation beam, a portion of the subject being positioned between the radiation source and the flexible digital imager; and

collecting an image with the flexible digital imager.

[c34] 34.The digital imaging method of Claim 33, wherein the subject comprises a section of an aircraft structure.

[c35] 35.The digital imaging method of Claim 34, wherein the subject comprises a fuselage, and wherein said embedding step comprises embedding the flexible digital imager between the fuselage and an insulation layer.

[c36] 36.The digital imaging method of Claim 34, wherein the subject comprises an aircraft wing, and wherein said embedding step comprises embedding the flexible digital imager within the aircraft wing.

[c37] 37.The digital imaging method of Claim 33, wherein the subject comprises a section of a pipeline.

[c38] 38.The digital imaging method of Claim 33, wherein said embedding step comprises embedding a plurality of flexible digital imagers in the subject.

[c39] 39.A linear array computer tomography (CT) scanner for imaging a subject illuminated by incident radiation , said linear array CT scanner comprising:
a flexible substrate;
a linear photosensor array disposed on said flexible substrate, said photosensor array comprising a plurality of photosensors arranged in a row and an addressable thin film transistor (TFT) array comprising a plurality of TFTs, each of said TFTs being electrically coupled to a respective one of said photosensors so as to selectively address respective photosensors in said linear photosensor array;
a scintillator disposed so as to receive and absorb the incident radiation, configured to convert the incident radiation to optical photons, and optically coupled to said linear photosensor array,
wherein said linear photosensor array is configured to receive the optical photons and to generate an electrical signal corresponding to the optical photons.

[c40] 40.The linear array CT scanner of Claim 39, wherein each of said photosensors

is oriented at a predetermined angle relative to an adjacent one of said photosensors, for alignment with the incident radiation, and wherein said flexible substrate and said linear photosensor array are arranged in a fixed configuration.

[c41] 41.The linear array CT scanner of Claim 39, wherein said linear photosensor array and said flexible substrate are configured to be adjustable for arranging each of said photosensors at a predetermined angle relative to an adjacent one of said photosensors.